DEPARTMENT OF AGRICULTURAL ECONOMICS AND EXTENSION

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Abstract.

Cotton is the main source of income for rural households in the smallholder-farming sector and provides employment at rural and national level. Despite the vital role played by cotton, production has declined since 1991. The main objective of the study was to identify the country's competitiveness and comparative advantage in cotton production. In addition the study highlights the factors affecting cotton profitability.

The world market was used to assess Swaziland's comparative advantage in producing cotton because of the on-going reforms in the SADC market. Smallholder farmers in kaKhuphuka have a DRC of 1.2 indicating that they would not be efficient competing on the world market. However, access to the Republic of South Africa results in higher prices and a DRC of 0.98, indicating efficiency in cotton production. There was a marked difference in the productivity of low and high performing smallholders, high performers achieved DRCs of 0.98 at world market prices and 0.87 at RSA prices.

Factors such as fertiliser application rate, area under cotton production, level of education, farming experience and pesticide use were important than credit in affecting yield, although credit was also significant at p=0.05. Low performing credit farmers are making negative profits and apparent irrational producing cotton. The study revealed that, if low performing farmers increase yields by 13% in order that they will be profitable at the rural daily labour wage rate. Alternatively low-performers are considered rational to continue producing cotton if one assumes that the opportunity cost of labour is 44% lower at E 4.50 per man day. Improvement of technology through research and extension is critical in increasing farmers' yields and subsequently both profits and Swaziland's competitiveness in cotton production.

1.0 Introduction

1.1 Background and justification.

Agricultural policies tend to influence the performance of the overall agricultural sector and commodity policies change the environment within which production takes place. Getting agricultural policies right is a prerequisite for stimulating smallholder agricultural development. Commodity policies influence input and output prices, efficiency, growth, development and operation of marketing institutions. Inappropriate agricultural policies that reduce or nullify the benefits of other development initiatives are of great concern to governments, donors and international agencies (F.A.O, 1987). Due to the on-going reforms in the Southern African market, SADC countries have to embark on those activities where there is efficient use of resources so that they can realise growth and development.

Poor economic growth and development that has affected many SADC countries in the 1970s and 1980s are derived not only from natural catastrophes, but also from agricultural pricing and marketing policies that shape the opportunities faced by farmers. Takavarasha (1991), highlighted that agricultural prices are seldom left to the market mechanism regardless of the political system or level of development, it is an area of policy decision making. The failure of such policies to provide incentive prices has always been penalised by static or declining production growth. Attractive producer prices alone are, however, not the panacea for solving production problems. Production response function also consists of infrastructure, adequate availability of inputs, technology change, credit, price of other commodities and extension services.

Dlamini (1997) mentioned that the interventions in agricultural pricing in Swaziland used to be producer oriented but are now usually consumer oriented. In the case of producers, prices are increased in order to increase farm incomes. In the case of consumers, the government's intervention is to keep food prices down. Often such a practice tends to tax the agricultural sector, which results in resources being transferred from agriculture to other sectors.

Cotton is the main source of income for rural households in the arid smallholder-farming sector and provides employment at rural and national level in Swaziland. Cotton plays a vital base for employment, rural and industrial development in many developing countries that grow and process it Morris *et al* (1988).

It is hoped that the outcomes of this paper will capture the imagination of policy makers, investors and other stakeholders in the country to design policies and strategies that are compatible with effective and efficient resource use in cotton production. This might create a policy environment that will ensure or facilitate sound resource investment in the cotton sub-sector, thus correcting its poor performance.

1.2 Problem statement and objectives.

Despite the vital role played by cotton in Swaziland, production has declined since 1991. The decline in cotton production has been accompanied by a reduction in the number of cotton growers. Poor producer prices have often been cited as the main factor depressing production (MOAC, 1996).

The premise is that smallholder farmers in Swaziland could increase agricultural productivity if policies and institutions affecting them become more responsive to their needs. This paper examines the country's comparative advantage in cotton production. There are two central questions concerning the cotton policy in the country: firstly, is it an efficient use of resources for Swaziland to produce cotton now and in the foreseeable future? The second is that if it is efficient, what combination of policy incentives and institutional change are needed to promote domestic cotton production.

1.3 Objectives of the study:

The main objective of this paper is to identify the country's competitiveness and comparative advantage in cotton production. In addition it highlights the factors affecting cotton profitability. In trying to achieve this objective, the impact of cotton pricing and marketing policies were analysed as they relate to smallholder growers in the marginal rainfall areas. Input and output markets were assessed to find out whether there are divergences and if they are, do they provide incentives or disincentives to smallholders.

1.3.1 Specific objectives of the study:

(i) To describe the operation of the cotton industry with particular attention to pricing and marketing policies.

(ii) To determine the profitability of cotton for smallholders in dry areas and to measure its competitiveness.

(iii) To determine the effect of current policies on cotton production incentives.

1. Description and analysis of the study area.

A formal survey using a structured questionnaire was conducted at kaKhuphuka to collect primary data. Primary data was collected in mid-March and April, 1999. The data was used to develop farm budgets for the smallholder cotton growers. Probabilistic random sampling was used to select a sample of 150 households from six villages within the study area. The households were selected from lists of cotton growers obtained from Vunisa and the resident extension agent to obtain a sample representative of the types of farmers on the basis of credit use and output in cotton production.

Secondary data were collected by reviewing literature on cotton production practices, annual production, input costs and output price. Data on large-scale growers and the market were obtained from the Swaziland Cotton Board annual reports and accounts. Information on other aspects of cotton marketing was obtained from interviews with key informant within the industry (Natex and Spintex). This included information on cotton prices, total imports, tax collected, input and transportation costs.

2.1 Households description and farming systems.

Not all sampled households in this area had the same access to the necessary elements for effective farming (land, labour and capital assets). The households differed from each other mainly in terms of land size, source of draft power, capital assets and also type of labour (family, permanent employed or seasonally labour). Those growers who owned tractors, cattle and larger pieces of land were considered to be rich. Moreover, these rich cotton growers had permanent employed labour but the number of labour varied per household. More than 90% of the farmers were not only cotton growers. Maize and cotton were the major crops grown by farmers at kaKhuphuka. In most cases the land was shared between these two major crops. However, farmers reported that maize is often destroyed by drought, which frequently occurs in this area. Legumes such as groundnuts, beans and cowpeas were mainly grown as minor crops for relish making. Inter-cropping was not a common practice except for pumpkins and maize grown in the same fields.

2.2. Grouping of cotton growers into credit and non-credit.

Some of the cotton growers were utilising a credit facility that is offered by Vunisa and others were not. This situation led into splitting of farmers into two main categories, credit and non-credit cotton growers. Moreover, this grouping of growers into categories was useful when analysing the effect of the credit subsidy in the Policy Analysis Matrix section. Using an average would hide the actual variation in production, which exist among farmers found in each category. Sixty- percent (90) were credit cotton growers and the forty- percent (60) were non-credit cotton growers. More than half (53.7%) of the non-credit cotton growers reported that they were not utilising the credit facility because of past experience. They said that, experience had shown them that clearing a debt with Vunisa was not easy because each time they made a delivery at the market they were told that they owe. Variations in cotton production activities between and within credit and non-credit growers were observed. Within each category of

growers there were differences in terms of input use, source of draft power, source of labour and yield, which led to the sub-division of growers into low and high performers. All those farmers who had three bales and below per hectare were classified as low performers, those who realised more than six bales were high performers. Those with 4 and 5 bales were not included in either category (39.3%).

2.3 Education and Farming experience

Nearly half (51.5%) of the cotton growers in the study had completed primary school. Only a few growers (8.1%) had not attained any level of formal education at all and none of the smallholder cotton growers had a tertiary level of education (college or university). Nearly two-thirds (63.2) of the respondents had more than 20 years of farming experience including the growing of cotton. Very few (0.06%) farmers belonged to the group of 1 – 5 years of farming experience.

2.4 Pesticides use.

About two-fifth (43.3)% of all the cotton growers were using Ripcord and Oncall for pest control. There wasn't much difference between credit and non-credit farmers in terms of quantities used. However, the use of rogor and ripcord was more prevalent in non-credit farmers, as such the average quantity used was 4 litres per hectare compared to 2.6 litres used by credit growers. Although these two pesticides could be regarded as "old chemicals", the farmers still have confidence in them.

None of the cotton growers did not use pesticides, the only variation was on the quantities used. A few credit farmers (18.7%) reported that they applied the pesticides as per extension recommendations. While the majority of credit and non-credit were practising prophylactic spraying. That is, they were spraying almost after every three to five weeks even if they do not see pests on their crop. Scouting of pests to determine whether to spray or not, was not really practised by the smallholder cotton growers in this area.

2.5 Source of draft power

Most of the rich farmers (86%) were using their own tractors and oxen as means of draft power. More than three-fifth (64.5%) of the respondents used government hired tractors for draft power mainly for land preparation. Most of them were from the credit category. Oxen were used for planting and sometimes inter-row cultivation when the cotton plants are young and short.

2.6 Gross cotton sales

The majority of the respondents (21.1%) had gross sales of E 2 940 to E 3 148.75 per hectare in 1997/98 marketing season. Nearly 8% had gross cotton sales of more than E 8 000 and 13.6% had sales of less than E 2 940 per hectare. Rich cotton growers who had their own source of draft power and had access to credit had higher gross cotton sales (E 9 362.30) in comparison with rich non-credit growers.

2.7 Sources of labour.

Cotton production is a labour intensive activity, from planting through to picking. For labour requirements most (49%) of the growers were depending on both family members and hired labour. About two-fifth (36.7%) of the cotton growers were relaying on family labour only for cotton production activities. Almost a sixth (14.3%) of all the cotton growers depended mostly on hired labour. Credit farmers had twice the number of hired labour than non-credit farmers.

Table 2.1. Summary of respondents' profile in the study (n = 150)

Characteristics of respondents	Percentage of respondents (credit and non-credit)	Respondents' most common character
Education	51.5	Completed primary school.
Farming experience	63.2	had more than 20 years Experience.
Pesticide use	43.3	Used Ripcord and Oncall for pest control.
Draft power	64.5	Hired government tractors.
Gross cotton sales in 1997/98 season	21.1	E 2 940 to E 3 148.75 per hectare.

Source: Survey data.

2.9 Cotton yields.

Variation in grower's yields was observed in each category of farmers. Among the 60 non-credit cotton growers 36.7% produced 2 and 3.6 bales (400 – 720kg) of seed cotton per hectare, while a few (18%) had yields as high as 7 to 11 bales (1560 to 2200 kg). The majority of non-credit growers obtained yields between 800 and 1 450 kg per hectare (Table 2.2). As for credit farmers, about 28% were getting low yields of less than 4 bales (800kg) and while a few (15.3%) had yields as high as 12 bales (2 400kg) per hectare. Even in this category of farmers, a majority obtained yields between 800 and 1 450 kg/ha.

Table 2.2. Average yields (kg/ha) realised by smallholder cotton growers in 1997/98.

Average yield (kg/ha)	credit growers(%)	non-credit growers (%)
400 – 720	28	36.7
800 – 1000	30.4	22
1 100 – 1 450	26.3	23.3
1 500 and above	15.3	18
Total	**100**	**100**

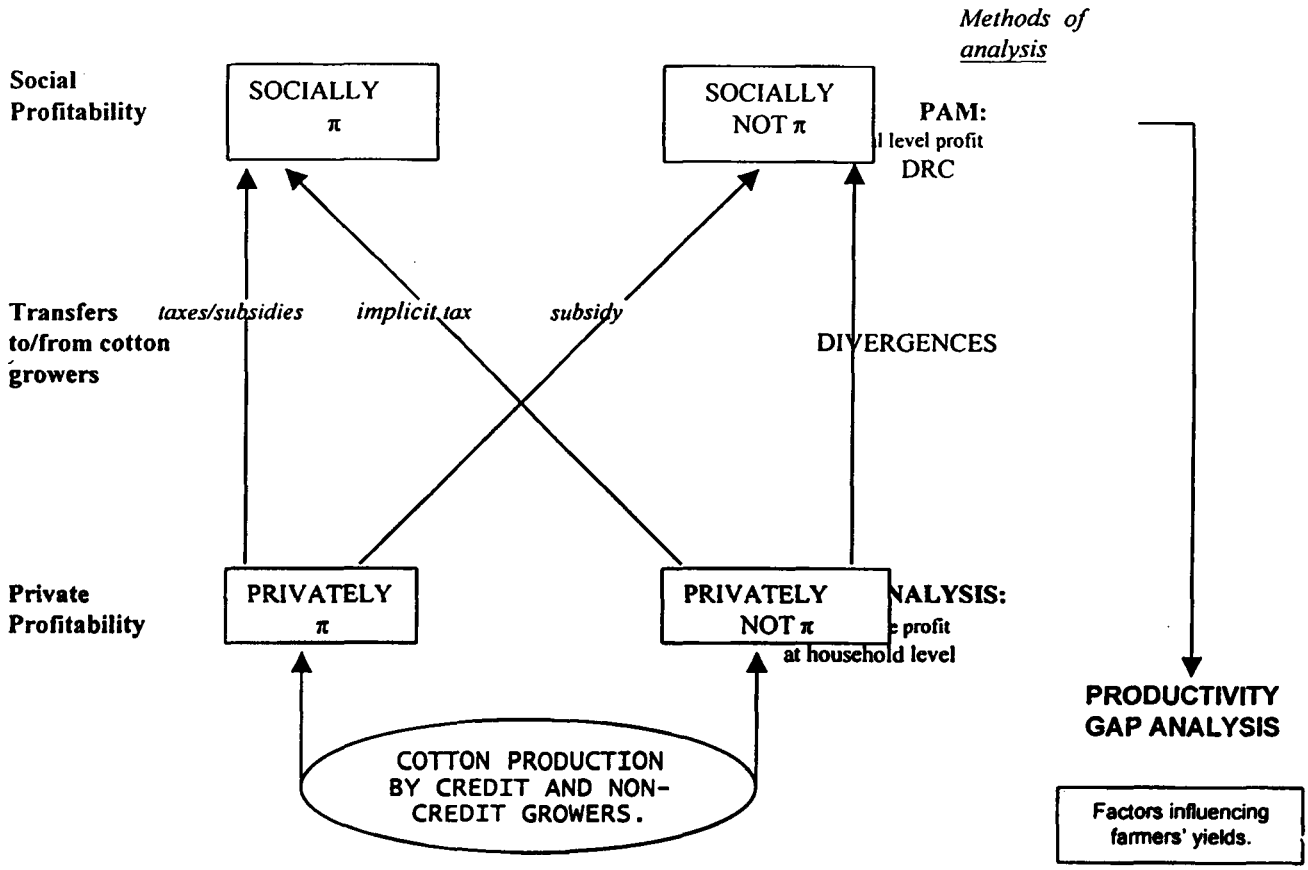
Source: Survey data.

3. Conceptual framework and analytical methods.

In principle, comparison of enterprises with respect to their returns to land and labour can be derived by the analysis of gross margins. The problem is that such analysis is done at the financial level at which prices are distorted by many interventions such as taxation, subsidies, price setting and over-valued exchange rates. Such distortions preclude judgements about profitability of commodities at the national level. To determine the comparative advantage, evaluation of prices is done at the national level using social prices rather than market prices.

To provide answers to the questions on the country's comparative advantage, efficiency in cotton production and the factors affecting cotton profitability, Gross Margins Analysis and a Policy Analysis Matrix were used. These analyses were complimented by a Productivity Yield Gap Analysis, where a simple yield production linear regression model was used to determine that had significantly affected farmers' cotton yields. Figure 2.1 shows the pathway of analysis that was followed in this study. The starting point was that, smallholder farmers with and without credit were involved in the production on cotton as an enterprise. An *a priori* expectation was that, at household level the enterprise could either be profitable or not for both categories of farmers. Gross Margin Analysis was conducted to find out if cotton production by each category of farmers was profitable.

Figure 3.1. An illustration of the conceptual framework used for analysis.



It is possible to observe high or low gross margins (gross profitability) in the performance of an enterprise that might be due to distortionary policies put in place by a government. For example, if cotton production in Swaziland is highly subsidised, its possible that the gross margins will be high indicating that cotton production is privately a worthwhile enterprise to invest in. Thus, relying on gross margin analysis alone might not give a true picture about the efficiency of cotton production in the country. The inverse being true, if the output market is heavily taxed low gross margins would be realised which might make farmers believe that cotton production is not profitable.

Vunisa being a state certified monopoly, it is possible that the cotton prices offered to farmers are low because the company is a legislated monopoly that tends to distort the market prices. It is here that a PAM is appropriate. The analytical tools were used as a chain feeding into the other.

3.1 Gross margin analysis.

In this paper, the gross margin was used to analyse the gross profitability of cotton production at farm level and it provided some indications to the country's continuous decline in productivity. However, it is important to note that, the gross margin is not necessarily a profit indicator although it assumes a linear model. Increasing the scale of operation could increase the gross margin proportionally and that will not mean that the activity undertaken is profitable. Therefore, it is vital that the total gross margin should be higher than the total overhead costs to be economically viable. For smallholder growers to continue producing cotton, it is important that their annual gross margins should increase over time (yearly) as the cost of production will be increasing too. The average income per hectare which farmers obtained from the cotton sales at Vunisa were considered as the gross income and the variable costs included the cost of

fertilisers, seed, chemicals, transport, labour and interest on credit.

3.2 Policy Analysis Matrix.

The PAM has been developed and used by Monke and Pearson (1989). Others who have used the Pam include Rausser and Zusman (1992), Katyamba *et al* (1994), Mbiha and Kashuliza (1994), Takavarasha (1996), Dlamini (1997) and Sifundza (1997). The PAM in this paper was used to measure the effects of cotton price intervention on producer's incentives and to analyse the impact of direct policy measures as well as effect of some of the indirect policies. The PAM is based on the concept of economic profit and the various components contributing to it. It may said to be a system of double entry bookkeeping, thus analysts using PAM have to provide complete and consistent coverage to all policy influences on returns and costs of agricultural production (Mbiha and Kashuliza, 1994).

3.3 Yield productivity gap analysis.

This analysis was conducted after realising that low performers were not making profits because of low yields. Therefore, some of the socio-economic and agronomic factors were regressed using a simple linear regression model as shown in the equation 3.1.

$$Y_d = f\,[X_1, X_2 \ldots Xn] \quad \ldots\ldots 3.1$$

Where : y_d is the yield differential

$x_1 \ldots x_n$ independent variables affecting yield.

A regression analysis equation is used to estimate the unknown value of one variable on the basis of the known value of the other variable. According to Mansfield (1994), regression analysis provides estimates of dependent variable for given values of the independent variable or it provides an estimate of the effect on the mean value of dependent variable (y) of a one-unit change in the independent variable (x). Some of the reasons for choosing a linear model have been listed by Mansfield as, the mechanics of least squares are fairly simple to understand and its parameter estimates have optimal properties of unbiasedness, efficiency and have the least mean-square-error.

4. Gross Margin Analysis.

Results from this analysis are based on the gross profitability of the cotton enterprise to smallholder farmers at household level.

4.1 Non-credit farmers.

(a) Average performance of non-credit farmers.

The average performance of non-credit cotton growers indicates a gross profit of about E 136.55 per hectare (Table 4.1). Based on these results one could be tempted to say that cotton production is a profitable enterprise for smallholder cotton growers in the marginal rainfall areas of Swaziland. The basis of these results may not give a true reflection because averages or means are mainly influenced by extreme values in a range.

(b) Low performer non-credit farmers.

By growing cotton, this group of growers tends to lose more than E 380.00 per hectare when their own labour is costed (Table 4.1). Their profitability is mainly affected by low yields, labour and pesticide costs. Although the costs of labour and pesticides are lower than that of high performers, they take a larger proportion of the grower's income.

(c) High performers non-credit farmers.

This group of farmers tend to realise a gross profit of more than E 800.00 per hectare. Although the cost of pesticides and labour is high that is being surpassed by the amount of income (E 4001.60/ha) this group of growers obtained from their sales (Table 4.1).

Table 4.1: Gross Margin Analysis for non-credit farmers (E/ha).

	Average performance	*Low performers*	*High performers*
Yield (kg/ha)	1240.00	750.00	1640.00
Price (E/kg)	2.44	2.44	2.44
Gross income	3025.60	1830.00	4001.60
Less variable costs:			
Seed	90.30	72.24	102.68
Fertiliser	205.73	143.08	299.78
Pesticides	924.27	618.25	969.14
Labour	1411.20	1264.80	1568.00
Draft power	111.05	87.49	181.71
Transport:			
Inputs	11.10	11.10	11.10
Produce	85.80	85.80	85.80
SCB levy	49.60	30.00	65.60
Gross Margin	**136.55**	**-385.86**	**814.69**

Source: survey data.

4.2 Credit farmers.

(a) Average performance of credit farmers.

Table 4.2 shows that, on average cotton growers who had access to credit made a gross profit of more than E 260 per hectare. Also drawing conclusions on the basis of these results only could lead to an incorrect information. It is therefore important to analyse each category before making any conclusions.

(b) Low performers credit farmers.

By producing cotton, this group of farmers tends to lose about E 197.32 per hectare when family labour is included at opportunity cost. Therefore cotton production by low credit performers is not profitable.

(c) High performers credit farmers.

A majority of farmers in this category are characterised by owning draft power (tractors and oxen). About 23% (21) of the credit farmers were belonging to this category. According to the analysis the production of cotton is a worthwhile enterprise to these farmers, since they make profits of E 686.22 as shown in Table 4.2.

Table 4.2: Gross Margin Analysis for credit farmers (E/ha).

	Average performance	*Low performers*	*High performers*
Yield (kg/ha)	1454.00	920.00	1780.00
Price (E/kg)	2.43	2.43	2.43
Gross income	3533.22	2235.60	4325.40
Less variable costs:			
Seed	110.27	85.14	108.36
Fertiliser	269.60	182.07	282.23
Pesticides	860.05	664.40	1130.60
Labour	1560.00	1209.60	1664.00
Draft power	120.00	105.00	135.00
Transport:			
Inputs	11.10	11.10	11.10
Produce	85.80	85.80	85.80
SCB levy	58.60	36.80	71.20
Interest on capital	194.08	149.91	247.79
Gross Margin	**263.74**	**-197.32**	**686.22**

Source: Survey data

4.3 Discussion of gross margin analysis results.

Cotton production was a profitable enterprise for credit and non-credit farmers in the marginal rainfall areas. Credit cotton growers obtained E 263.74 as profit per hectare and non-credit growers E 136.55. There was a slight difference of about 100 kg between the mean yields of credit and non-credit cotton growers that did not lead to a large difference in terms of mean profit. The profit of credit cotton grower's was about E 130.00 higher than that of non-credit growers.

Despite pesticide subsidy by the Swaziland Cotton Board, pesticide costs were also high for these cotton growers. Such that, credit and non-credit farmers used about E 860.00 and E 924.00 per hectare on pesticides respectively. The survey revealed that ripcord and oncall were the mostly used pesticides by both categories of farmers. Credit farmers used more than 3 litres of oncall in hectare and less than 2 litres of ripcord. And non-credit growers used about 3.74 litres per hectare of ripcord and a few used oncall. The use of ripcord and rogor was more prevalent in non-credit rich farmers. It also came out from the survey that cotton growers still have confidence in these two pesticides, although they are thought to be old and expensive.

The situation was not the same with high performing cotton growers. In both categories of farmers, cotton was a profitable enterprise. These growers realised positive gross margins of about E 686.22 and E 814.69 per hectare for credit and non-credit farmers respectively. Credit cotton growers obtained less profit than non-credit farmers did. Interest that was paid by credit farmers made their profit to be less than that of non-credit farmers. This may be one of the reasons, some cotton growers do not utilise the credit facility that is offered by Vunisa. The high spread in interest rates means that the opportunity cost of using on farmers is the 11% they could obtain on bank savings.

5. Policy Analysis Matrix.

In the PAM framework, productivity of the different categories of farmers is compared at market prices to measure private profitability and at national opportunity costs to measure social profitability.

5.1 Valuation of output and inputs for the PAM.

The impact of agricultural policies is measured relative to what prices would have been, had there been no interventions and a free trade regime exists. According to Monke and Pearson, world prices are the backbones of social valuation and efficiency analysis of agricultural systems. Gittinger (1992), states that, an efficiency price is an economic value used in economic analysis that reflect the opportunity cost or value in use of a good and it may be a market price or shadow price.

5.1.1 Private valuation

Valuation of the first row of the PAM is achieved by using market prices. A market price by definition is one at which goods and services actually exchanged for other goods or services or for money. It can be referred to as a transaction that occurs at any location not necessarily a village or wholesale market. It is the observed prices.

5.1.2 Social valuation

Valuation of the second row of the matrix is based on transforming the private prices to appropriate social prices. Thus social prices are estimates of efficiency prices; they are not market prices. Social prices are used when the market price is felt to be a poor estimate of economic value because it does not reflect scarcity or opportunity cost. The choice of appropriate shadow prices is crucial for DRC calculations if a government is unable to adopt the first best (free trade) policy (Dodge, 1977).

(a) Tradable commodities:

For all tradable commodities, the reference prices are the border prices that would have prevailed under an intervention free regime (Krueger *et al*, 1988). That is to say, for tradable commodities the appropriate price would be the world price. Dodge also pointed out that, if the theory of the second best policy is pursued, world prices are the correct shadow prices for tradable commodities.

(i) Output:

The average cotton production of smallholders ranged from 750 kg to 1 780 kg per hectare. The difference in yield could be attributed to a number of factors including technology, socio-economic and natural factors. The average market price was E 2.43 and E 2.44 per kilogram for credit and non-credit farmers respectively based on the survey results reflecting prices from Vunisa. The 1998 world cotton lint price was used to derive the social price of seed cotton using Jansen's 1992 methodology of deriving the farm gate price of Zimbabwe seed cotton. The social price for seed cotton was E 2.19/kg using world price and E 2.30/kg using RSA price (see sections 4.3.2.1 and 4.3.2.2).

(ii) Cotton seed:

Cotton growers buy seed from the Swaziland Cotton Board depot at the Low veld Experimental Station and other Central Co-operative Union depots. Acid delinted seed was used by farmers and it was sold at E 2.58/kg. SCB subsidies seed at 20%, therefore the economic price of seed in this study was E 3.10/kg.

(iii) Fertilisers:

There are two types of fertiliser used in cotton production, 2:3:2 (22) which is a compound fertiliser used for basal dressing and LAN (28% N) used for topdressing. At market price, the farm gate price for 2:3:2 (22) was E1.27/kg and E 1.30/kg for LAN (28% N). In Swaziland, agricultural inputs are exempted from any form of taxation. There was no evidence of taxation or subsidisation observed in the selling of fertilisers. Therefore, the economic price of fertiliser was assumed to be the same as the market price.

(iv) Pesticides:

They were many different types of pesticides that were used by cotton growers (Appendix 3). Pesticides were subsidised at 20% (Appendix 4) by the Swaziland Cotton Board. Therefore, the economic price of pesticides was equivalent to the market price plus 20%. As such, the economic price varied according to each pesticide used.

(b) Domestic resource factors:
For non tradable goods or domestic resources such as land, labour and capital the opportunity cost price is used, the underlying principle is in terms of national income forgone by not employing the factor in its next best alternative activity in the domestic market (Tsakok, 1990). Input factors such as land, labour, transport, draft power and capital constitute the category of domestic resource factors of production.

(i) Labour:
Theoretically, the opportunity cost of labour in the production of a commodity is its contributions at margin to production of best alternatives. It is equal to average wage rate on competitive labour markets. Labour is an important input in cotton production especially at peak periods (weeding and picking). In this study the private price of labour reported by cotton growers in the survey was E200.00 per month or E 8.00 per man-day. This labour cost was assumed to be the social cost of labour, as labour in smallholder farms is not influenced by labour unions and represents the opportunity cost of family labour.

(i.a) Issue of thin labour markets:
Although the opportunity cost of labour in this study was estimated at E 8 per man-day, it is possible that it over exaggerates the opportunity cost of family labour. When considering family labour in reality, the E 8/man-day could be observed during peak periods in cotton production (weeding and picking). It is likely that the wage rate of family labour is close to zero or it lies between zero and E 8/man-day. Therefore, break-even wage rate for family labour was also calculated to understand the rationale of low performers continuing to produce cotton.

The inclusion of family labour at an opportunity cost of E 8/manday is likely to make some cotton growers realise negative profits. Negative profits should not be misconstrued as evidence of irrational behaviour of the smallholder farmers but evidence of divergence between household specific opportunity cost of factors of production and prices observed in the local thin markets which have been used as best estimates of shadow prices.

(ii) Land:
The rental value of land that is determined in competitive land rental market might fully reflect the economic value of land. However, land markets are often thin or absent, as is usually the case in smallholder agriculture sectors of Southern Africa (Magagula and Faki, 1996). The value of land can be determined as the residual of value of output or best alternative crop. Residual values of land are not easy to estimate.

The absence of informal land markets makes it very difficult to estimate the economic value of land. Therefore, the only alternative was to determine the social value of land in relation to alternative uses in this case, sugar cane production. However, this tends to include effects of externalities and imperfections that might influence the profitability of cotton. Moreover, in the dry middleveld and the lowveld there is no shortage of arable land. This is demonstrated by the availability of unutilised land in these regions. Based on the already mentioned limitations, in this study the social value of was considered to be zero[1]. It is possible that this could bias the DRCs, and therefore sensitivity runs that taking varying land rents into accounts as suggested by Magagula and Faki were carried out. In their study they assumed a land value of E 150.00 per hectare for rainfed crops.

(iii) Capital:
For the approximation of economic cost of capital a 30% market interest rate prevailing in 1997/98 fiscal year was used based on bank loan rate. The interest rate used for financial or private analysis was 20% that is different from the economic analysis of 30% because of the subsidised credit loan given to smallholder cotton growers by Vunisa, the only buyer of cotton in Swaziland.

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[1] According to Masters it is possible to construct the PAM ignoring the value of land or giving it a fixed value. The value of land is important only for comparisons between crops where land intensity is an issue.

5.1.3.1 Derivation of producer parity price using world price of cotton lint.
The world price is used as the basis for the social price in order to determine whether Swaziland would have a comparative advantage if it did not have preferential access to the protected RSA market. Trading relationships are changing and Swaziland has to consider its position to compete on the world market.

The social price of seed cotton was derived using Jansen[2] method that was used to determine the farm gate price of seed cotton in Zimbabwe. According to Jansen, 35% of seed cotton weight is lint. In a similar situation, Gersovitz [3](1992) in Coted'Ivoire stated that it is 40.19%. The Jansen method was followed since the Zimbabwe cotton production situation is similar to the Swaziland one.

The exchange rate that was employed in the determination of social costs was E 5.2335/US$. This was the rate prevailing in March 1998. There was no parallel foreign currency market that would instigate the calculation and use of a shadow exchange rate. On account of the existence of a fairly free-market for foreign currency, it was assumed that the nominal exchange simulates its shadow level. There was no need to do a sensitivity analysis basing on exchange rate because there was no evidence of the existence of a black market exchange in the country.

The Liverpool price index for cotton lint was 93.98 cents (US currency) per pound in March 1998.
World price of cotton lint is equal to 93.98 c/lb.
Equivalent to 93.98c x 2.205 = 207.2259 c/kg
Official exchange rate in March 1998 was US $1 = 5.2335
Therefore conversion factor was = 1/5.2335
= **0.1911.**
Thus cotton lint world price in Liverpool in local currency was

$$\frac{2.072259}{0.1911}$$

= E 10.84384615/kg or 108.44 c/kg.

Assume an output of 1 ton.
Vunisa ginning costs are E 1.12/kg of cotton lint[4].

	Price (E)
Net realisation	**10 843.84**
Less ginning costs (E 1.12/kg)	**1 120.00**
Less port handling costs charges (US$300)[5]	**1 570.05**
Less transport costs from Durban	
Port to London market [6]	**1 384.00**
Equals lint revenue (E/t)	***6 769.79***
Less transport to Durban (E/t)	**118.00**
Less handling charges 5%	**338.49**
Border price at Big Bend	***6 313.30***
Less local transport (E/t)	**12.00**
Less SCB levy charge (4c/kg)	**40.00**
Price at Big Bend	**6 261.30**
Seed cotton producer price	**35% of E 6 261.30**
	2 19.145/t
Equivalent to	***2.19/kg***

[2] Jansen (1992), used the world cotton lint price to derive the farm gate price for Zimbabwe farmers.
[3] Gersovitz also used world cotton lint prices to get the price of seed cotton in Coted'Ivoire.
[4] Vunisa stated that their ginning costs were between E110 and E115/kg.
[5] Port handling charges paid by Shipment Services is US$300.00
[6] Used Shipment Services (Zimbabwe) transport cost from Durban to London market; US$ 1250/5 tonnes.

5.2.1 Private profits.

(a) Average performance of smallholder cotton growers:

In order to clearly view the comparative results between cotton growers who received credit from Vunisa and cotton growers who did not, the results from the PAM have been synthesised to show the key results in compressed tables as per Table 5.2.1*. Cotton production by smallholder farmers in the marginal rainfall areas was privately profitable in 1997/98. This farm activity generated revenue of about E 3 533 per hectare at costs of E 3269.48 for credit farmers (Table 5.2.1). And non-credit cotton farmers made about E 3 025 per hectare as revenue at costs of E 2 889.05. As such credit and non-credit cotton growers were able to make profits of just more than E 260.00 and E 130.00 per hectare respectively.

Table 5.2.1: Comparative table of average performance for smallholder cotton growers in 1997/98 cropping season (E/ha).

	Credit farmers			Non-credit farmers		
	Private values	**Social values**	**Divergences**	**Private values**	**Social values**	**Divergences**
Revenue	3533.22	3184.26	**348.96**	3025.60	2715.60	**310.00**
Tradables	1239.92	1387.90	**- 147.98**	1220.30	1364.00	**- 144.06**
Factors	2029.56	2126.60	**- 97.04**	1668.75	1668.75	**0.00**
Profit	**263.74**	**- 330.24**	**593.98**	**136.55**	**- 317.51**	**454.06**

Source: Primary data

(b) *Low performers (smallholder cotton)*:

Cotton production by low performers in 1997/98 was not a profitable activity at all in the marginal rainfall areas. Credit cotton growers netted a loss of more than E 190.00 per hectare whilst non-credit growers had a loss of about E 380.00 per hectare (Table 5.2.2).

Table 5.2.2: Comparative table of low performers in 1997/98 cropping season (E/ha).

	Credit farmers			Non-credit farmers		
	Private values	Social values	Divergences	Private values	Social values	Divergences
Revenue	2235.60	2014.80	**220.80**	1830.00	1642.50	**187.50**
Tradables	931.61	1117.93	**- 186.32**	833.57	1000.28	**- 166.71**
Factors	1501.31	1576.26	**- 74.95**	1382.29	1382.29	**0.00**
Profit	**- 197.32**	**- 679.39**	**482.07**	**- 385.86**	**- 740.07**	**354.21**

Source: Primary data

(c) High performers (smallholder cotton):

In 1997/98 cotton production on the representative farms of credit and non-credit cotton growers classified as high performers was privately profitable. This activity generated revenues of about E 4 325.00 for credit cotton growers at costs of E 3 639.18 per hectare. As such, cotton production resulted into high performing credit growers making profits of more than E 686 per hectare (Table 5.2.3). Like wise non-

* Full Policy Analysis Matrices are reported in the appendix.

Therefore, the 219 cents/kg or E 2.19/kg was used in this study as the world price of seed cotton when calculating the social revenue in the PAM.

5.1.3.2 Derivation of producer parity price using RSA price of cotton lint.

	Price
The average cotton lint selling price in RSA	826.58 c/kg.
Assuming a tonne of cotton lint	826.58 * 1000kg
Equivalent	*R 826 580.00/t*

Official exchange rate R 1.00 = E 1.00[7]

Using Jansen's method of deriving farm gate seed cotton price, and assuming that the Vunisa ginning costs are E 1. 12/kg of cotton lint.

	Price (E)
Net realisation per tonne	8 265.80
Less ginning cost	1 120.00
Less transport cost to RSA (Durban)	118.00
Less handling charges 5%	318.81
Equals lint revenue (E/t)	6 708.99
Seed cotton price at Vunisa	35% of 6 708.99
Equals seed cotton price	***2 348.15***
Less local transport	12.00
Less SCB levy charge (4c/kg)	40.00
Seed cotton producer price (E/t)	2 296.15
Equivalent to	*2.30/kg*

THE DOMESTIC RESOURCE COEFFICIENT RATIO (DRC or DRCR)

(Comparative advantage).

The domestic resource cost (DRC) measures the efficiency of an activity in transforming domestic resources into foreign exchange (Dodge, 1977). The domestic resource cost is used measuring the comparative advantage of an activity. Masters stated that the DRC is a standard unit-free way to present the national profitability. The DRC enables the determination of how competitive a domestically grown crop is on the world market. It gives an indication of whether the value added in social prices is less or greater than domestic factor costs (Monke and Pearson, 1989). If the value added is less than the factor costs, then the DRC will be greater than one implying that the domestically produced crop such as cotton is not competitive. It would mean that cotton was produced at social costs that exceeded the cost of importing. Thus the country does not have a comparative advantage in producing that crop.

Therefore, the DRC is ratio of domestic factor costs to value added as measured in opportunity costs, that is, the DRC measures domestic factor costs per unit of tradable value added.

$$DRC = \frac{G}{(E - F)} \quad \text{or} \quad (\sum_r N_r X_{ri}) / (P_I Q_I - \sum_r R_j Q_{ji});$$

Where:

N_r : Opportunity cost of unit of domestic factor of production r.
X_{ri}: Quantity of factor r used in activity i.
P_I : Import or export parity price of tradable product i.
Q_I : Quantity of tradable product i.
R_j : Import or export parity price of tradable input j.
Q_{ji}: Quantity of tradable input j used in activity or crop i.

The denominator in the equation gives the value added by activity i and the numerator gives the economic value or cost of domestic resources used to produce Q_i.

[7] Both countries are members of the Common Monetary Area, formerly known as the Rand Monetary Area.

credit cotton growers made profits of more than E 815 per hectare after incurring costs of about E 3 186.91. High performers realised better profits than lower performers regardless of access to credit or not. This suggested that there are other factors that contribute to profit besides credit.

Table 5.2.3: Comparative table for high performers in 1997/98 cropping season (E/ha).

	Credit farmers			Non-credit farmers		
	Private values	Social values	Divergences	Private values	Social values	Divergences
Revenue	4325.40	3898.20	**427.00**	4001.60	3591.60	**410.00**
Tradables	1521.19	1725.43	**- 204.24**	1371.60	1600.92	**- 229.32**
Factors	2117.99	2152.43	**34.44**	1815.31	1815.31	**0.00**
Profit	**686.22**	**20.34**	**665.88**	**814.69**	**175.37**	**529.82**

Source: Primary data

5.2.2 Social profits.

Social profits are an efficiency measure of an activity because outputs and inputs are valued in prices that reflect scarcity values or social opportunity costs. Social profit is the difference between revenues and costs all measured in social prices.

(a) *Aggregate average performance of smallholder cotton growers*:

On average cotton production by smallholder farmers is not socially profitable for both categories at world market prices. By growing cotton, credit farmers realised a loss of about E 330 per hectare and non-credit farmer's loss was close to E 317 per hectare at national level (Table 5.2.1). The results indicate that if Swaziland has to compete on the world market cotton production by smallholder farmers is an activity that is economically undesirable. Therefore, the government is providing incentives to smallholder farmers to produce a crop that may be socially unprofitable; it was not able to supply the RSA market. Implicit transfers of approximately E 350 per hectare to credit cotton growers and E 310 to non-credit growers reflects the incentives to farmers.

(b) Low performers:

Social profitability as depicted in Table 5.2.2, reflects a general loss in cotton production at the national level for low performers cotton growers. When considering the situation of private profitability low performers would be better off not growing cotton because of the negative profits. As such cotton production by low performers is not competitive at all. Therefore, this category of farmers may be better to switch from cotton production into other crops which do not require a lot of inputs (labour, pesticides and fertilisers) like some of the legumes (beans, cowpeas) and sweet-potato that were found to be grown within the study area.

(c) High performers:

Social profits indicate that these groups of farmers are efficient in growing cotton for the world market (Table 5.2.3). At national level credit farmers made profits of more than E 20 per hectare, for non-credit farmers it was approximately E 175 per hectare. The results showed that non-credit cotton growers were more efficient in cotton production than credit cotton growers. This arose from the use of scare but subsidised credit resources with an opportunity cost interest rate of 30%.

5.2.3 Divergences (taxes and subsidies).

Divergences are distortions preventing full opportunity cost price from prevailing in domestic markets for commodities, inputs and factors of production. Divergences can also be explained as the difference between private and social valuation of revenue, tradable input costs, domestic resource costs and profits.

(a) Output market divergences:

From the results tables (Tables 5.2.1, 5.2.2 and 5.2.3) positive divergences are observed in the output market. According to theory, positive divergences indicate transfers to farmers and it provides incentives to farmers to grow cotton. The divergence on output had on average made cotton production to be privately profitability for smallholder farmers. Thus on average, there is a divergence of about E 350 per hectare with respect to revenue in the case of credit cotton growers (Table 5.2.1). In the case of non-credit farmers, there was divergence of about E 310.00 per hectare. These divergences indicate that there would be a transfer of income to both credit and non-credit smallholder cotton growers, because of the deviation of the producer price in private prices from its world market equivalent. This divergence is the result of access to the protected RSA market. Such that, smallholder cotton production would be unprofitable if Swaziland were to export on the world market. When considering the different sub-groups (low and high) of cotton growers, the results also show positive divergences. That is, there was a transfer of more than E 220 per hectare to credit farmers and about E 190 to non-credit low performers cotton growers (Table 5.2.2). Despite the implicit transfer to this group of farmers with respect to revenue cotton production was neither privately nor socially profitable.

However, the results show that for high performers, cotton production is privately and socially profitable for both credit and non-credit farmers (Table 5.2.3). Although there was an implicit transfer of approximately E 430 per hectare to credit farmers and about E 410 to non-credit farmers, the activity remained socially viable. Therefore in the case of high performers, the prevailing cotton pricing and marketing policies provide incentives to this group of farmers to produce an economically desirable crop at national level.

(b) Tradable input market transfers:

The results of the study indicate that tradable inputs are subsidised for all groups of farmers by the existing pricing policies (Tables 5.2.1, 5.2.2 and 5.2.3). On average smallholder cotton growers with credit had a subsidy of close to E 150 per hectare and those without credit were subsidised by more than E 140 per hectare with respect to tradable inputs (Table 5.2.1). This is an indication of incentives to smallholders. As such the income transfer to farmers led into private profitability of the activity. As regards to low performers, the divergences of more than E 180 and E 160 for credit and non-credit cotton growers respectively are signs of income transfer to this group of growers (Table 5.2.2).

The group of high performers also received subsidies as shown by the divergences of more than E 200 per hectare in both categories of farmers with respect to tradable inputs (Table 5.2.3). This group of high performers purchased tradable inputs at a subsidised price, which led to the private and social profitability.

(c) Divergences in domestic factor markets:

Domestic factor markets did not tax smallholder cotton growers. The results indicate a transfer of about E 100 per hectare to credit growers (Table 5.2.1). The zero divergence observed on non-credit farmers occurred because they did not receive any subsidised credit and the cost of land was assume to be zero.

(d) Divergences in overall profitability

Divergences in overall level of profit provide net measure of aggregate transfers or net incentives. Therefore, it is not enough to assess the level of transfers in output and input markets or markets of each of the domestic factors as transfers in one market can be offset by transfers in another market.

In this study, if market failures are assumed to be unimportant or ignored, then the net transfers observed in Tables 5.2.1, 5.2.2 and 5.2.3 measure mainly the effects of inputs and output pricing policy in the cotton industry. The results of the study reveal that, cotton growers would not be competitive on the world

market even though privately it is a profitable activity. Their private profits are increased because of the subsidising policy on markets of output, tradable and factor inputs.

5.2.4 Efficiency indicators and Comparative advantage.

The results are calculated on per hectare basis and are of interest within a farming system. According to Masters, ratios are absolute free measures of profitability and they are used for comparisons across different sectors in a farming system.

The PCR, NPC and EPC are different measures of transfers to or from farmers (Table 5.2.4). Then the DRC measures the national profitability and it a typical way of measuring the comparative advantage. The lower the DRC, the less is the domestic cost of earning a unit of foreign exchange, so the more comparative advantage is enjoyed by that activity.

Table 5.2.4. Coefficients of transfer effects and comparative advantage on the world market.

		AVERAGE PERFORMANCE		*LOW PERFORMERS*		*HIGH PERFORMERS*	
		Credit	Non-credit	Credit	Non-credit	Credit	Non-credit
PCR	C/(A-B)	0.88	0.92	1.15	1.39	0.76	0.69
NPC	A/E	1.04	1.03	1.11	1.11	1.06	1.08
EPC	(A-B)/(E-F)	1.15	1.15	1.45	1.55	1.18	1.11
DRC	G/(E-F)	1.18	1.23	1.76	2.15	0.99	0.91

Source: survey data.

5.2.4.1 Coefficients of transfer effects.

(i) Private Cost Ratio (PCR).

The results show a PCR of 0.88 and 0.92 for credit and non-credit smallholder cotton growers on average (Table 5.2.4). These PCRs indicate that cotton production by smallholder farmers is financially viable. In the case of credit cotton growers the PCR indicates that for every E 0.88 of domestic factor costs used, E 1.00 net revenue is generated. And likewise, for every E 0.92 of domestic factor costs incurred by non-credit growers, E1.00 is generated as net revenue. Thus non-credit smallholder cotton growers use more of domestic factors than credit growers do, which tends to lower the margin between private revenue and costs.

The results also show PCRs of 1.15 in the case of low performers credit growers and 1.35 for non-credit growers in the same group (Table 5.2.4). These results indicate that low performers cotton growers incur more costs in terms of domestic factors to generate revenue of E 1.00. Such a situation led to this group of cotton growers to realise negative private profits.

On top of that, the results in table 5.2.4 show PCR of 0.76 for credit farmers and 0.69 for non-credit cotton growers in the group of high performers. Such results mean that, for every E 1.00 revenue generated by high performers credit cotton growers a E0.76 domestic factor costs is incurred. The case being the same for non-credit farmers, that is, for every E 0.69 of domestic factor costs used, E1.00 is generated as net revenue.

(ii) Nominal protection Coefficient (NPC).

The nominal protection coefficients in Table 3.1.5 are generally above one, suggesting that smallholder cotton growers were receiving more on output prices (market prices) than the world prices. On average the estimated NPC was 1.04 for credit growers and 1.03 for non-credit cotton growers (Table 5.2.4). This implies that the producer prices of cotton for credit and non-credit smallholders were 4% and 3% above the world price equivalent of seed cotton respectively. Due to the incentives provided by the high producer prices as a result of access to RSA market, the activity was privately profitable to smallholders.

As for low performers, the NPC was 1.11 for both credit and non-credit growers (Table 5.2.4). These results mean that both categories in this group of growers received 11% more on producer prices than the actual world prices. This is an indication of incentives.

The NPCs for high performers were 1.06 for cotton growers with credit and 1.08 for those without credit (Table 5.2.4). This implies that, the producer prices or market prices were 6% and 8% above the social prices for credit and non-credit growers respectively. In respect to these protections, the activity's private profits were higher than the social profits for both credit and non-credit cotton growers in this group of high performers.

(iii) Effective protection coefficient (EPC).
The EPCs for all categories of farmers in Table 5.2.4 are substantially above one and also above the NPCs, showing transfers to smallholder cotton growers in the marginal rainfall areas. Moreover, Table 5.2.4 show that on average the EPCs were 1.15 for both credit and non-credit cotton growers. This means that value added in private prices was 15% more than what it would be without distortions. Farmers were receiving incentives from both product and input markets.

The EPC for low performers with credit was 1.45 and 1.55 for those without credit (Table 5.2.4). This indicate that lower performers cotton growers were receiving incentives from product markets such that, in the case of those with credit, the value added in market prices was 45% and 55% for those without credit more than what it would be without marketing and pricing policy distortions.

Table 5.2.4 also shows EPCs of 1.18 and 1.11 for high performers credit and non-credit cotton growers respectively. Such a situation implies that the value added in private prices was 18% for credit farmers and 11% for non-credit farmers more than what it would be without distorting policies in the cotton industry. Therefore, high performing cotton growers were receiving incentives from the cotton market.

5.2.4.2 Comparative advantage.
The results show average DRCs of 1.18 for credit farmers and 1.23 for non-credit (Table 3.1.5). These DRC values are above one, indicating that smallholder cotton production would not be efficient on the world market. This situation implies that on average there is no comparative advantage in cotton production on the world market. The condition of not having a comparative advantage is also observed in the case of low performers. The DRC values are 1.76 and 2.15 for farmers with credit and without credit respectively. The situation is different when considering high performing cotton growers. For this group of cotton growers the DRC values were slightly less than one, for credit farmers the DRC was 0.99 and 0.91 for non-credit farmers. This indicates that, high performers cotton growers have a comparative advantage since the values are lower than one. In Swaziland, growth can be maximised by expanding cotton production up to a point where the DRC = 1 in the case of high performers. However, a simulation on table 5.2.5 shows that both categories of farmers on average have a comparative advantage for as long as they sell to RSA market.

When using RSA cotton price, cotton production is privately and socially profitable for smallholder farmers (Table 5.2.5). The DRCs for farmers with and without credit were 0.98 and 0.97 respectively, indicating comparative advantage.

Table 5.2.5: Average performance of smallholder cotton growers Policy Analysis Matrix using RSA price (E/ha).

		Revenues	Tradables	Factors	Profit
Private Values	Credit growers	3533.22	1239.92	2029.56	263.74
	Non-credit growers	3025.60	1220.30	1668.75	136.55
Social values	Credit growers	3523.50	1387.90	2126.60	9.00
	Non-credit growers	2989.20	1264.36	1668.75	56.09
Divergences	Credit growers	9.72	147.98	97.04	224.74
	Non-credit growers	36.40	144.06	0.00	87.66
	DRC for credit growers =		**0.99**		
	DRC for non-credit growers =		**0.97**		

5.2.5 Sensitivity analysis.

The two main factors that affect the comparative advantage are crop yields and the international commodity prices. Well the effect of the exchange rate may also come into consideration especially if there are considerable deviations from the real exchange price or existence of black markets. In this study, it been assumed that the prevailing exchange rate simulates the real one. Although the price of land was assumed to be zero in the previous analysis, under this section the price of land was taken to E 150/ha as suggested by Magagula and Faki.

First the average DRCs were recalculated at 10% reduction in world cotton prices and later when the land opportunity cost was considered to be E 150/ha. The increase in the production of cotton substitutes like the synthetic fibres, it is likely that the world demand of cotton will decrease leading into reduction in cotton world prices.

(a) The world cotton price falls by 10%.

If the world cotton price would fall by 10%, cotton production by smallholders would be privately and socially unprofitable. This means that the prevailing pricing and marketing policies would encourage all smallholder farmers to grow a crop in which the country has got no comparative advantage. On average cotton growers would continue making private profits where else at national level cotton growing would be undesirable. Therefore cotton production by smallholders would not be competitive because of the negative social profits that would be realised even in the case of high performers (Table 5.2.6).

Table 5.2.6: Comparative table of high performers using 10% fall in world price (E/ha).

	Credit farmers			**Non-credit farmers**		
	Private values	Social values	Divergences	Private values	Social values	Divergences
Revenue	4325.40	3506.60	**818.80**	4001.60	3230.80	**770.80**
Tradables	1521.19	1725.43	**- 204.24**	1371.60	1600.92	**- 229.32**
Factors	2117.99	2152.43	**- 34.44**	1815.31	1815.31	**0.00**
Profit	**686.22**	**-371.26**	**1057.48**	**814.69**	**-185.43**	**1000.12**

Source: Primary data

As much as the activity would remain private profitable, they will be no comparative advantage on the world market. The DRC values of 1.28 for credit farmers and 1.31 non-credit farmers indicate that, on average it will be costly to use domestic factors for cotton production in a situation where the world price had fallen by 10%. This would not be a surprise since under the current situation, the country's comparative advantage is only observed in high performers where it is also very low.

This means that under the current yields a 10% fall in world price of cotton could make all smallholder farmers to be inefficient in cotton production and Swaziland would not be competitive on the world market at all.

(b) Using E 150/ha as the social value of land.

Previously in this study, the social cost of land has been set to equal zero according to Jansen, Masters, Sifundza and Dlamini. However, in this section of the study the land value was assumed to be E 150/ha as suggested by Magagula and Faki. According to these authors this land cost reflects different average land productivity under differing land use conditions and tenure rules. In the lowveld the values are much lower than high agro-ecological potential areas (highveld and western middleveld). If the land price is taken into account, on average farmers would continue making private profits but not social profits. High performers cotton growers would make profits privately and socially, however, their social profits would diminish (Table 5.2.7). Interestingly, this group would continue having comparative advantage in cotton production on the world market because of the DRC values of 0.97 for credit farmers and 0.94 for non-credit farmers.

Table 5.2.7: Policy Analysis Matrix for high performers smallholder cotton growers when land price is taken into account. (E/ha)

		Revenues	Tradables	Factors	Profit
Private Values	Credit growers	4325.40	1521.19	2117.99	686.22
	Non-credit growers	4001.60	1371.60	1815.31	814.69
Social values	Credit growers	4095.30	1725.43	2302.43	67.44
	Non-credit growers	3701.10	1600.92	1965.31	134.87
Divergences	Credit growers	230.10	- 204.24	- 184.44	618.78
	Non-credit growers	300.50	- 229.32	-150.00	679.82
	DRC for credit growers =		**0.97**		
	DRC for non-credit growers =		**0.94**		

Source: survey data.

5.2.6. Performance of non-credit cotton growers using 11% as the opportunity cost price for capital.

Even though non-credit cotton growers do not pay interest on capital, they forgo an interest of 11%, which their money could have earned if it was deposited in a bank account. Farmers rely mainly on family labour for their production operations, therefore the cost of labour was not included in the calculation of interest because farmers do not actually pay family labour but retain profits instead. If the cost of family labour was included in calculating interest that would exaggerate the amount of capital used. By including the opportunity cost of capital non-credit farmers would realise private profits of less than E 20 per hectare and at national level the activity would be making negative profits. Basically, this means that, by not including the opportunity cost of capital the profitability of the activity was exaggerated. However, the high performers still realise profits of more than E 664 per hectare and a DRC of 0.99 (Table 5.2.8).

Table 5.2.8: High performers non-credit smallholder cotton growers Policy Analysis Matrix using 11% as the opportunity cost price for capital (E/ha).

		Revenues	Tradables	Factors	Profit
Private Values	Non-credit growers	4001.60	1371.60	1965.29	664.71
Social values	Non-credit growers	3591.60	1600.92	1966.71	23.97
Divergences	Non-credit growers	410.00	-229.32	-1.43	640.75
	DRC for non-credit growers =		**0.99**		

Source: Survey data.

5.2.7. Are low performers smallholders cotton growers irrational by growing cotton?

This is one of the most important questions, which arise from the analysis in this study. To provide suggestions or ideas, which could be used to come up with effective policies for this group of farmers, it could be better to estimate the breakeven yield and breakeven family labour wage rate. The major reason of considering yield and family labour is that low performers cotton growers realised negative private profits because of low yields and they relied on family labour for their production activities.

5.2.7.1 Breakeven yields.

Under the current marketing and pricing cotton policies, where there is transfer of income to cotton growers in the output market, low performance cotton growers can breakeven when, credit farmers obtain yield of 1001.2 kg/ha and non-credit farmers obtain yield of 908.14kg/ha. Thus a situation would ensure that low performers are not making any losses in terms of private profits neither would they make any profits. Credit farmers need to increase their yields by 81 kg/ha and non-credit farmers have to increase their yields by 158.14 kg/ha.

Since some of the farmers within this study area were able to realise high yields, that, is an indication that even this group of farmers may obtain such yields. May be if they can increase fertiliser application rate, pesticides use, increase area under cotton and have access to credit since these variable had significant influence on farmer's yields[8].

5.2.7.2. Breakeven labour wage rate.

The study survey results indicate that a majority (87.3%) of low performers, regardless of the different categories, relied on family labour for their cotton production activities. It is possible that the labour cost used had over exaggerated the opportunity cost of family labour

If credit and non-credit smallholder low performers cotton farmers could use E5.96 and E4.48 per man-day for labour, that could reduce their domestic factor cost in terms of private prices. Such labour costs could make low performers not to realise negative profits by growing cotton.

5.3. Discussion of PAM results.

Cotton production was a privately profitable activity for both credit and non-credit farmers in the marginal rainfall areas. The profits were strongly positive in market prices leading to credit cotton growers obtaining E 263.74 as profit per hectare and E 136.55 in the case of non-credit growers. Non-credit cotton grower's profit was about half the profit of credit cotton grower. Such difference in profits could be attributed to the significant difference in yield between the two categories of smallholder cotton growers. Surprisingly, not all smallholder farmers realised private profits by engaging in cotton production. In the

[8] These variables were significant at $p = 0.05$ after linear regression analysis was done.

case of low performers in both categories of farmers, cotton production was not privately profitable because of the low yields that they obtained.

Smallholder cotton growers enjoyed profits at market prices, this would not be socially profitable if Swaziland competed on the world market. This means that the access to the RSA market, the pricing and marketing policies put in place by the government are encouraging farmers to grow cotton.

The average performance private cost ratio for smallholder cotton growers were 0.88 and 0.92 for credit and non-credit farmers respectively. These PCRs indicate that cotton production by smallholder farmers is financially viable. In the case of credit cotton growers the PCR indicates that for every E 0.88 of domestic factor costs used, E 1.00 net revenue is generated. And likewise, for every E 0.92 of domestic factor costs incurred by non-credit growers, E1.00 is generated as net revenue. Thus non-credit smallholder cotton growers use more of domestic factors than credit growers do, which tends to lower the margin between private revenues. This means that cotton production by smallholders in Swaziland can afford to pay domestic factors and still remain financially competitive.

The nominal protection coefficients were all above one in both categories of farmers. This implies that, there would be transfers of income in the product market to smallholder cotton growers at world prices. On average the NPC were 1.04 for farmers with credit and 1.03 for those without credit. This tends to indicate that smallholder cotton growers were receiving 4% more in market prices than its equivalent world price. Growers without credit received 3% more market prices. Such incentives are observed in private profits for farmers with the exception of low performers. Such NPC values are magnified by the huge divergences in the output markets that led to farmers to obtaining high positive profits in market prices but realising negative profits in social prices.

The effective protection coefficients of all categories of farmers were above one indicating that they were transfers to smallholder cotton growers in the marginal rainfall areas. The average EPC was 1.15 for both credit and non-credit cotton growers. This means that value added in private prices was 15% more than what it would be without distortions. Farmers were receiving incentives from product markets. These implicit transfers in the product market made smallholder's cotton production to be privately profitable but they would not be at world prices.

Due to the unprofitability of the activity at national level, the DRC values were above one when using world prices. This implies that there is no comparative advantage for smallholders to produce seed cotton if Swaziland competes on the world market. Only high performers have a comparative advantage in cotton production when the opportunity land price was taken into account and the world price could not fall by 10%. Access to RSA market makes the country to be competitive in cotton production. The DRCs values were 0. 98 for credit farmers and 0.97 for non-credit farmers when using RSA prices.

When comparing these two categories of farmers, labour was the most expensive input. Credit farmers used E 1 560 and non-credit farmers E 1 411 per hectare for labour. It is important to note that, family labour was also included in the calculation of labour cost. This was done in recognition of the contribution made by family labour in the production of cotton under smallholder conditions. This observation is in agreement with Master's (1989) conclusion that cotton is the most labour intensive cash crop. Labour is required for almost the entire period of the crop whilst still in the field. Cotton growers reported that weeding and picking are main operations, which need a lot of labour to be carried out.

Although some smallholder farmers would not have a comparative advantage in cotton production that, does not mean that they have to forget about the production of cotton because some farmers within the same area have a comparative advantage. The low performers were unable to make profits both at private and national price because of low yields. So it became imperative to consider those variables that had an influence on yield. Such analysis led to the next chapter on the analysis of factors affecting farmer's yield.

6. Yield productivity gap analysis.

Yield is important in farmer's profits as the discussion of break-even yield shows. However, not all farmers in this study obtained high cotton yields to offset the costs of production. On average credit farmers had slightly higher cotton yields than non-credit farmers but significant ($p = 0.05$). Since averages are sensitive to extreme values in a range, relying entirely on them may not lead to sound policy formulation.

In the previous analysis it was observed that low performing farmers irrespective of the category made negative profits privately and socially. Where as high performers made profits at market prices and at national level. Yield was identified to be the main contributing factor in farmers' profits and efficiency in cotton production. Low performers credit farmers' yield was almost half (920kg/ha) the yield of high performers (1780 kg/ha). In the case of farmers without credit, high performer's yield (1640 kg/ha) was double the yield of low performers (750 kg/ha).

6.1 Factors affecting cotton yields

The following socio-economic factors had a significant influence on farmer's cotton yields[9]: area under cotton production, education, age, farming experience, expenditure of basal fertiliser, expenditure of pesticides, and access to credit. Surprisingly variable such as source of draft power, expenditure on top dressing fertiliser and labour did not significantly influence yield at $p = 0.05$ nor at $p = 0.10$.

Therefore the difference between low and high performer's yields can be explained by those variables that were significant, as shown by the linear regression model (equation 1).

$Y_d = f\,[X1, X2 \ldots Xn]$

Where: y_d is the yield differential.

X1,X2...Xn are the independent variables

$y_d = f$(*education, farming experience, cotton area, expenditure on basal fertiliser and pesticides, and credit*)..... (1)

The variables affecting cotton yield can be written as a yield model:

$y_c = 2.467 + 0.235\ C_a + 0.549\ B_f + 0.22\ Fc + 0.035\ P_c + 0.253\ E_l + 0.108 C_r$ ..... (2)[10]

$R^2 = 0.763$ Adjusted $R^2 = 0.749$ $F = 54.079^{**}$

Where:
- y_c = mean cotton yield
- C_a = area under cotton
- B_f = expenditure on basal fertiliser
- Fc = years of cotton production
- C_r = access to credit
- P_c = expenditure on pesticides
- E_l = education level

The model was adopted because the R^2 of 76 percent and adjusted R^2 of 75 percent were high, which gave a good fit of the independent variables. The F-statistics was significant indicating that these statistics of the regression were significant at $p = 0.05$.

In equation 2, the constant means that once cotton is planted, significant output per hectare will be realised by smallholder growers. The area under cotton variable indicates that, an increase in area planted to cotton will result in a significant increase in cotton yield. The expenditure on basal fertiliser variable means that an increase in basal fertiliser application rate would increase the cost of fertiliser but it will lead to

[9] These variables were significant at $p = 0.05$ (Appendix 2) after running a linear regression model.

[10] The standard errors of the coefficients are in appendix 2.

significant increase in cotton yields. Like wise the expenditure on pesticides variable indicates that an increase in pesticide application rate will result in a significant increase in cotton yield. The education variable indicates that an increase in the farmer's level of education will significantly increase cotton yield. The cotton farming experience variable means that, as farmer's experience increase in cotton growing a significant increase in yield is observed. Access to credit was the least significant variable.

Expenditure on basal fertiliser variable had a high coefficient estimate followed by area under cotton production and level of education whereas access to credit had the lowest (equation 2). The basal fertiliser factor indicates that smallholder cotton growers should apply fertiliser at planting for cotton yields to increase. This tends to make sense in that, the high performers incurred higher costs on basal fertiliser than the low performers and their yields were indeed higher. Low performing credit farmers applied 103.45 kg whereas the high performing ones applied more than twice (217.86 kg/ha) that amount of fertiliser at planting. The story was the same with non-credit farmers, that is, low performers applied 98.56 kg/ha and the high performers applied 206.41/ha (Appendix 3). Although, the high performers applied higher dosages at planting, that rate is below the recommended fertiliser rate for cotton production in the region[11]. According to the regression analysis, an increase in basal fertiliser application rate by 1kg will result in an increase of cotton yield by 0.55 kg. Therefore, under the existing cotton pricing and marketing policies smallholder farmers can increase the output by increasing fertiliser rates at planting.
Although access to credit variable had the lowest coefficient that does not mean that credit is the least important factor in cotton production. By being positive significant it means that credit did influenced cotton yield. Equation 2 shows that a unit increases in credit will increase smallholder yield by 0.108 units. In this study credit farmers had higher yields than non-credit farmers did in all the different categories of cotton growers. Credit is therefore a factor in increasing yields but not the most important factor. The high cost of credit because of the large spread between savings and credit makes it less attractive to farmers.

Since land shortages are not common in the lowveld, smallholder farmers can increase their yield by putting more land into cotton production. However, farmers are not likely to put most of their land into cotton production because they have to produce food crops such as maize. Although increasing cotton land would increase output significantly but it is not be easily feasible for farmers to do that because of labour and capital shortages. The way out would be to consider fertiliser application.

Smallholder's level of education also significantly affected yield. The results indicate that a unit change in the level of education will result in 0.253 unit change in yield. As cotton growers attain higher levels of education that increase their yield. From appendix 3, there were few high performers who did not attain any formal education compared to low performers. The explanation is that, farmers with higher levels of education can read and understand better than uneducated farmers. As such, low performers did not get high yields as high performing farmers because there were many low performers who had low levels of education.

6.2 Discussion of yield productivity gap analysis results.
The estimated production model shows that smallholder cotton yield is responsive to socio-economic factors and agronomic practices such as education, years of cotton production, credit, pesticides and basal fertiliser application rates.

Since the level of smallholder education influenced yield as shown in the production model, if it would be assumed that education and understanding are related, then it is justified that high performers had higher cotton yields than low performers. Table 8.1 shows that, there were many high performers how attained formal education than low performers. Therefore, the high performers had a better understanding of the importance of good agronomic practices in cotton production.

[11] The recommended fertiliser application rate is 350 to 400 kg per ha (Production Advisory Bulletin no. 1)

8.0 SUMMARY AND CONCLUSION.

The main objective of this study was to asses Swaziland's competitiveness and comparative advantage in cotton production. To achieve this objective, cotton pricing and marketing policies were analysed as they relate to smallholder cotton growers in the marginal rainfall areas. Input and output markets were assessed to find out whether they are divergences and if they are divergences, do they provide incentives or disincentives to smallholders. Tables 7.1 and 7.2 show the overall summary of the study results.

Table 7.1: Summary of the results.

	Gross Margin	Return to labour	Using world price		Using RSA price	
			Social Profit	DRC	Social Profit	DRC
Av. credit growers	263.74	7.23	- 147.98	1.18	9.00	0.99
Av. non-credit growers	136.55	7.56	- 144.06	1.23	56.09	0.97
High perf. credit growers	686.22	8.41	20.34	0.99	-	-
High perf. non-credit grow.	814.69	8.22	175.37	0.91	-	-
Low perf. credit growers	-197.32	6.76	- 679.39	1.76	-	-
Low perf. non-credit growers	-385.86	6.81	- 740.07	2.15	-	-
10% fall in world price for:						
(a) high performers credit growers			- 371.26	1.21	-	-
(b) high performers non-credit growers			- 185.43	1.11	-	-
Including E 150 as land price:						
(a) high performers credit growers			67.44	0.97	-	-
(b) high performers non-credit growers			134.87	0.94	-	-
11% as opportunity cost for high performers non-credit growers			- 236.03	1.15	-	-

Table 7.2: Break-even yields and break-even labour wage rate for low performers.

	Break-even yield (kg/ha)	Break-even labour wage rate (E/man-day)
Low performers credit growers	1 001.20	5.96
Low performers non-credit growers	908.14	4.48

One of the main questions in this study was to find out if cotton was either privately or socially profitable, or both. The study results showed that privately cotton production was a profitable enterprise for both credit and non-credit growers with high performing farmers realising higher profits. On average cotton production was socially not profitable to smallholders except for the high performers. Therefore, the results do not support the hypothesis that the country would be efficient in cotton production on the world market. Its competitiveness is limited to high performing cotton growers but not low performing ones. On top of that, the PAM results as discussed in chapter 7 showed that smallholder cotton growers would have made negative social profits in 1997/98 season on the world market. Therefore, smallholder cotton growers in the marginal rainfall areas make profits by growing cotton only because of their access to the RSA market.

The monopoly power granted to Vunisa does not encourage competition in the cotton market. The *a priori* expectation would be that, the cotton growers would be taxed thus the divergences from the output market would not provide incentives. As such, in the study it was also hypothesised that smallholder cotton growers are indirectly taxed due to the existing marketing monopoly. This hypothesis is not accepted on the grounds that the results revealed that the government, by establishing prices based on the Liverpool price index, ensures that the Vunisa monopoly pays farmers prices above export parity to the world market. The effect of distortions in the output market showed that smallholder cotton growers receive more revenue than what they would get under world prices because of the bridging costs, which would be

involved. On average credit farmers were getting 11% above the world border parity price because of the access to the RSA market.

Moreover, smallholder cotton growers were categorised based on whether they used credit or not. In this study credit was assumed to be an important determinant of higher profits. Which led to the third hypothesis of this study that, access to formal credit by smallholder cotton growers affects cotton productivity in marginal rainfall areas. This hypothesis is also not accepted because credit farmers' profits were not on average much higher than that of non-credit.

It is important to note that low performing cotton growers do realise positive private profits if the opportunity cost of labour rate is reduced. If a lower opportunity cost of labour is assumed then even at the current yields, low performers are rational when producing cotton. The study has also demonstrated that, if low performers credit farmers can produce 1001.20 kg/ha and non-credit farmers produce 908.14 kg/ha they can breakeven in private profits. This means that if this group of farmers can just increase their yields by 13%, they obtain positive profits. These farmers can increase their cotton yields by increasing the rate of basal fertiliser application.

Swaziland appears to have appropriate prices for seed cotton, the problem is the technology used. Farmers have been using Albacala 72 for about three decades, new varieties have not been made available to farmers such that its productivity is now low. Such a conclusion is in agreement with Krishma's observation concerning a balanced strategy between producer price and improved technology.

A major finding is that government's intervention in cotton producer prices appears to offset the price distortions, which would arise from an uncontrolled monopoly. Farmers in Swaziland receive more than they would if they exported to the world market. The cotton pricing and marketing policies that are put in place provide an implicit subsidy to the sub-sector despite the non-existence of comparative advantage. Such a policy should normally be implemented in an activity where the level of comparative advantage is large.

Farmers' yields responded to socio-economic and agronomic factors. The government policy of promoting cotton production through access to RSA markets may not be sustainable. Research and extension policy that would improve, the present production technologies in the smallholder sector is desirable, since farmer's yield would improve. Thus ensuring that the country remains competitive on the regional and world market. Moreover, the textile industry imports cotton lint from regional markets instead of purchasing domestic lint. This may change if yields are increased, increasing the profitability of cotton at lower prices.

A substantial improvement in the quality of cotton research and extension is necessary in order for cotton growers to obtain adequate levels of farm income because on-farm research results have revealed that more than two tonnes per hectare can be obtained from farmers' fields. This must be done in line with the government's objective of increasing rural incomes and encouraging cash crop production not only to increase income but also to diversify export earnings. The improvement of the cotton extension services could increase farmers' yields.

Way forward for smallholder farmers.

Access to the protected RSA market makes Swaziland competitive in cotton production. Such a situation may not hold in the near future because of the market reforms that are taking place within the SADC region. Once the SADC market is fully liberalised, it is possible that the South African market will be open to other regional markets, then Swaziland would not be competitive in cotton production. Moreover, RSA has just signed a free trade protocol with EU and EU is a member of the World Trade Organisation (WTO) which is advocating for free trade among countries. This would have an effect on the textile industry because they would start buying cotton lint from cheaper sources. Furthermore, RSA and Zimbabwe are negotiating for free trade, Zimbabwe is one country in Southern Africa which has a comparative advantage in cotton production such that the cotton prices are low.